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Shopping in the scientific marketplace: COVID-19 through a policy learning lens

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ABSTRACT

In this article, we explain how the COVID-19 wicked crisis context influences the quality of critically needed epistemic policy learning and undermines policy effectiveness. We explore those influences on two main dimensions: Vertically (pertaining to the selection of core scientific advice) and horizontally (pertaining to managing scientific interdisciplinarity). We apply the concept using COVID-19 policy responses from England and Belgium, offer an explanatory framework, and provide recommendations for policymakers, including (i) Crafting a policy-science-public narrative maintaining independence, openness, and trust. (ii) Outlining the limitations of science and public expectation setting. (iii) Enhancing interdisciplinarity in policy formulation by utilizing boundary and discipline-spanning structures, and systems thinking mechanisms for dynamic problem synthesis.

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Policy learning; epistemic learning; wicked problems; crisis governance; COVID-19

1. Introduction

A zigzagging rabbit, continuously recalculating its trajectory, learning from its surroundings and the consequences of its actions. This image painted by Dunlop, Radaelli, and Trein (2018) probably best captures the COVID-19 policy battle. Within weeks of ambiguity and uncertainty, COVID-19 had rippling global implications from health to social life to public policy and governance. The epidemiological novelty of COVID-19 stretched healthcare systems to the breaking point (Heymann and Shindo 2020), thus calling into the battlefield other dimensions of public policy such as crisis management, learning, and scientific knowledge (Weible et al. 2020).

In conditions of technical complexity and ambiguity, learning from a range of scientific communities with statutory rights of consultation can be critical (Baekkeskov and Öberg 2017; Hulme 2012). The COVID-19 crisis constitutes an ideal case for the research and practice of policy learning for two main reasons. First, COVID-19, being: an intense global shock facilitating learning allowing the generation of insights through

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comparing approaches and lesson drawing (Rose 1991). Such shocks can facilitate learning through the detection of systematic deficiencies, likely inducing policy change (Gerber 2007; Schmidt and Radaelli 2004). Second, the nature of COVID-19 as a "wicked" problem with multidimensional definitional and knowledge gaps (George et al. 2020), no enumerable set of solutions, low failure tolerance, and strong temporal constraints (Rittel and Webber 1973; Peters 2017). Such lack of definitional and solution clarity necessitates extensive learning among stakeholders (Head and Alford 2015). Here, learning can improve policymakers' sensemaking and the ability to address complex issues (Weible et al. 2020; Weick 1988). However, engaging in such learning is not a straightforward endeavor as integrating scientific advice into policy design and implementation is challenging, and consequences of sub-optimal learning are taxing (Dunlop, James, and Radaelli 2020).

In this article, we assist policymakers to manage the integration of scientific knowledge into policy responses within wicked crisis contexts, which remains understudied at this scale. We do so by answering the question of how can wicked crises compromise the quality of epistemic policy learning? We argue that the inherent definitional characteristics of such crises can compromise the quality of learning and undermine the effectiveness of critical policy responses. To present our analysis, we synthesize a two-dimensional factor termed "epistemic venue-shopping," and empirically explore the two dimensions contrasting cases from England and Belgium. With the COVID-19 crisis still unfolding, and the risks of similar crises recurring, we offer recommendations to practitioners to strengthen policy responses by opening a window into epistemic policy learning in crises and shedding light on key dynamics.

In the next section, we identify the most functional mode of learning for the COVID-19 crisis and synthesize our proposed factor. In Section 3, we present the methods used. We provide case analysis in Section 4. Finally, recommendations and conclusions in Section 5.

2. Synthesizing epistemic venue-shopping

2.1. A highly functional learning mode for COVID-19

While policy learning can strengthen policy responses facing crises (Birkland 2006), dysfunctional or sub-optimal learning can worsen already complex situations leading to policy failure (Dunlop, James, and Radaelli 2020). Hence, identifying a functional learning mode is necessary for wicked crises where solutions applied cannot be undone (Head and Alford 2015). We start by illustrating why epistemic policy learning (i.e. learning from a "network of professionals with recognized expertise and competence in a particular domain and an authoritative claim to policy-relevant knowledge" (Haas 1992)) is considered appropriate for a COVID-19 policy response. To do so, we utilize Dunlop and Radaelli (2013) framework streamlining modes of policy learning as either reflexive, epistemic, bargaining-oriented, or hierarchal, based on two dimensions: problem tractability, and certification of actors. This framework directly links the two factors at this study's core; problem tractability (COVID-19) and certification of actors (scientists) to identify functional learning modes. A problem of low tractability is of high uncertainty. This resonates with the COVID-19 crisis as experts are still exploring

its epidemiological characteristics, developing diagnostic, treatment, and vaccination protocols (Heymann and Shindo 2020). Certification of actors describes the presence of socially endorsed groups or organizations with scientific or expert authority to make evaluative judgments. With significant technical complexity, scientists and specialized research organizations constitute highly certified groups of actors for COVID-19 policy responses (Weible et al. 2020). Hence, the COVID-19 crisis provides for a high certification of actors and low tractability, placing it within the realm of epistemic policy learning. Despite being a functional learning mode, we acknowledge that epistemic policy learning still entails challenges such as relating to representativeness and accountability (Jasanoff 2003).

2.2. Synthesizing epistemic venue-shopping

Here, we synthesize a two-dimensional factor termed "Epistemic venue-shopping" referring to the policymakers' process of identification, selection, and use of scientific expertise in the policy formulation process within wicked crises. The vertical dimension is concerned with selections within the core (primary) scientific discipline informing policy. The horizontal dimension is concerned with selecting the range (multitude) of scientific disciplines informing policy. At this stage, our use of "vertical" and "horizontal" does not imply interaction effects between dimensions but rather visualizes intradisciplinary (vertical) versus interdisciplinary (horizontal) variations.

Though governments should carefully identify the range of expertise while employing epistemic learning (Craig 2019), we posit that the wicked crisis context can influence such identification and constrain the quality of learning. To offer our synthesis, we draw on common attributes of the policy process theories converging on a context of policymaking (wicked crisis), a political system (with legacies), problem definitions (agenda setting), consideration of policy options (epistemic inputs), and policy implementation (Jordan 2001; Kingdon 1984; Easton 1965).

2.3. Vertical venue-shopping

We postulate that a wicked crisis can create influences leading to vertical epistemic venue-shopping, thus affecting the selection of scientific approaches informing policy formulation. These influences are facilitated by two sets of factors: the production, and consumption (selection/use) of knowledge.

On the knowledge production front, epistemologists have subjective homegroup orientations (Pattyn, Gouglas, and De Leeuwe 2020). Additionally, the multiplicity of scientific approaches spurred by uncertainty is naturally higher in early-stage knowledge development (Feynman 2005). This multiplicity creates an epistemic marketplace with varying epistemological products for policymakers to "buy into," a phenomenon already observed in varying COVID-19 policy responses (Moon 2020).

On the knowledge selection and utilization front, epistemic knowledge and politics are entangled (Straßheim 2020). Learning from scientists can be used to legitimize prefabricated positions and serve political agendas (Weiss 1986), or fall victim to conflicting sensemaking frames (Rubin and de Vries 2020). Here, notions of contingencies and

self-reinforcements resulting from policy legacies come into play as policymakers likely steer away from epistemic advice least consistent with their preferences (Heclo 1974; Vergne and Durand 2010; Dunlop 2017). This can limit the range of scientific solutions viable for policymakers to "buy into" as political considerations still exist during crises (Craig 2019; Sibony 2020).

These factors can place policymakers in an "epistemic marketplace" with varying "scientific products" and relatively high purchase power. The wicked crisis context increases this power for three main reasons: First, the public space is less conducive for disagreement and contestation as rapid responses are expected (Van Dooren and Noordegraaf 2020). Second, the complex nature of the crisis limits contestation spaces to groups of actors certified to participate in an informed debate (Dunlop and Radaelli 2013). Third, rapidly oscillating public attention cycles given the existence of competing for multi-dimensional issues resulting from the crisis (Silver 2019).

2.4. Horizontal venue-shopping

Core scientific knowledge of the COVID-19 crisis can position medical scientists as primary producers of standards at the core of policy design (Dunlop and Radaelli 2013). However, it is likely insufficient to produce informed policy responses in multi-faceted ambiguous contexts. Interdisciplinarity and multiplicity of perspectives improve situational synthesis and sensemaking (Endsley 1997; Rubin and de Vries 2020). However, this can be either overlooked or complex to identify given the ambiguity and influences of such crises (Moynihan 2009). Adequate interdisciplinarity can be inhibited by three main issues: First, the averseness to multiplicity to avoid confusion under temporal pressure (Van Dooren and Noordegraaf 2020). Second, the difficulty of identification, given the ambiguity of wicked crises (Head and Alford 2015). Third, policymakers struggle to cope with information overload and identifying key epistemic inputs to focus on (Jones and Baumgartner 2005; Bawden and Robinson 2009). Hence, policymakers can be prone to forming myopic or conical views overlooking the multi-faceted nature of the crisis-affected by overly selective interpretation of the environment and failure-inducing groupthink (Hart 1990). This can reduce the effectiveness of policy instruments by overlooking their behavioral embeddedness within larger social contexts. Implications of behavioral epistemology in terms of narratives, risk perception, and public engagement have established impacts on the acceptance of policies, thus absorption and compliance (Jones and McBeth 2010; Silver 2019). Insights from behavioral sciences can induce first-order changes (Hall 1986), leading to fine-tuning policy instruments, thus improving social-fit, and consequently effectiveness. When there are stronger behavioral implications, such insights can even invalidate the viability of medically-driven policy measures if proven as socially impractical as such responses are culturally mediated (Tyshenko and Paterson 2010). A COVID-19 implication entails overlooking the social embeddedness and behavioral consequences of medically driven policy responses (such as social distancing and lockdowns). This is despite knowing that community response and compliance with these policies are key factors in defining their effectiveness (Hartley and Jarvis 2020; Moon 2020).

Table 1. Key COVID-19 performance indicators.

Country	Cases[1] (per 100,000)	Deaths (per 100,000)	Highest Excess mortality[2]
United Kingdom	456	69	39.86
Belgium	602	85.6	24.29
Italy	410.58	58.22	16.65
France	262.95	45.06	24.31
Spain	614.6	60.59	43.58

3. Methods

We employ a plausibility probe as a methodological tool for refining and exploring theoretical propositions in early-stage hypothesis development (Eckstein 1975). We triangulate inputs from public statements, news reports, standardized open expert interviews, and official reports utilizing a thick descriptive approach. We concisely define cases on the three-dimensional plane outlined by Rohlfing (2012): Temporal, substantive, and actor-oriented. The use of narrative case studies is well-situated to explore both the notions of contingency and interdisciplinarity (Garud, Kumaraswamy, and Karnøe 2010).

We adopt an instrumental case study approach to provide exploratory insights contributing to early-stage theory and concept formation (Stake 1995). A similar input, different outcome case selection strategy is employed (Gerring 2008). Both cases are of countries considered to have under-performed in terms of containment as an outcome of the crisis (relatively higher cases, deaths, and excess mortality). However, each of them adopted different epistemic learning strategies and thus policy responses as inputs (delayed lockdowns in England vs. stringent early lockdowns in Belgium). We analyzed inputs from expert interviews using blended coding, thus maintaining theoretical focus and openness to explore expert (Saldaña 2015; Skjott Linneberg and Korsgaard 2019).

4. Analysis

4.1. The case of England: vertical epistemic venue shopping

For better context on COVID-19 performance in England and Belgium, Table 1 provides a comparative view of key performance indicators for the two jurisdictions among European COVID-19 hotspots.

In this case, we will focus on England as other nations of the UK exercised varying degrees of autonomy in COVID-19 responses. The COVID-19 controversy in England emerged with the initial policy response reported as driven by "herd immunity" (Grey and MacAskill 2020; Sibony 2020). With public and scientific pressure, the government considered delayed lockdowns. During the second week of March, the Oxford Stringency Index logged an average stringency of 13 for the United Kingdom, while Sweden (a no-lockdown exemplar) at 25, Belgium at 39, Spain at 50, and Italy at 71. This is despite the UK having more cases than Belgium and Sweden at the time[3]. Hence, the English response differed in approach then lagged in timing. Both of the government's policy responses were announced with the mantra of "following the science" (Lee 2020). The delayed lockdown was presented as motivated by avoiding "behavioural fatigue." However, several experts criticized this approach claiming that

the country's death toll could have been drastically reduced if the lockdowns were introduced earlier, a debate that gained traction in the UK parliament (Cooper 2020; UK Parliament 2020). Interestingly, six hundred of the UK's behavioral scientists contested the government's approach stating that behavioral fatigue is not sufficiently evidence-based to justify delaying the lockdown (Sky News 2020a). Other experts likened this to "playing roulette" with the public (Peat 2020). At the time of writing this article, only 12 publications with "behavioural fatigue" in the "topic" field were found on the Web of Science database, most of which were irrelevant to public health or social studies. Here, we observe a paradox where the government claims to have listened to science, yet their approach remains: 1) Vastly opposed by the domain scientists from which it has emerged. 2) Shown by different expert models to possibly lead to excessive fatalities. This raises the question of what has likely contributed to the government's adoption of those policies?

Here, we explore if there are signs of policy legacy contingency possibly influencing epistemic policy learning for COVID-19 by using decision patterns as initial indicators (Garud, Kumaraswamy, and Karnøe 2010). We start with the tangible implications of the government's initial policy choices and their underlying political logic. An evident implication of either response (herd immunity, then delayed lockdowns) is that the economy remains relatively open, consequently enduring relatively less damage compared to what would result from an early-on lockdown (The Guardian 2020a; Migone 2020). Evidently, there were recent similar patterns favoring economic growth in the government's paradigm. Our starting point on the path is a brief account of the economic dimension's salience in the Brexit discourse. Viewing the bedrock over which the current policy system rose to power, we see the emphasis on a stronger economy and job growth being a centerpiece of breaking away from the European Union (Tendera-Wlaszczuk 2018; Dunlop, James, and Radaelli 2020). This emphasis continued to ripple, favoring market mechanisms, even extending to controversial debates about the privatization of some healthcare services, (The Lancet Oncology 2019). Interestingly, the Prime Minister articulated this emphasis within the COVID-19 context in early February warning against letting the virus cause "unnecessary economic damage" and calling on the UK to take off its "Clark Kent spectacles," keep boundaries open and emerge as a supercharged economic power (Prime Minister's Office 2020). This policy preference was also confirmed in our exploratory interviews. Yet, is it plausible that this policy inclination and sensemaking frame proactively found a foothold in science during the crisis? Literature shows that the extent to which policymakers listen to scientific advice can be influenced by its political ramifications. Policymakers can identify/craft favorable lessons when existing ones are unfavorable for their policy preferences (Dunlop 2017). To explore this possibility, we look at two main dimensions of the UK's COVID-19 epistemic policy learning: independence (Dunlop and Radaelli 2018), transparency, and openness (Dunlop, James, and Radaelli 2020).

The principles of giving scientific advice to the government ensure independence from political influence, freedom to publish and transparent communication to the public (Government Office for Science 2010). However, as the government sought advice from the Scientific Advisory Group for Emergencies (SAGE), several challenges

to those principles emerged. The group has a varying membership structure, which led to concerns regarding the government's influence on the committee's memberships and proceedings. Later it was found to have been attended by- and included civil servants, senior political advisors to the Prime Minister with significant absences of virologists and public health experts (Lee 2020). This was viewed as convenient for the government's predetermined policy orientation and a "mockery" of the committee's ability to give independent advice (Lawrence, Carrell, and Pegg 2020; Scally, Jacobson, and Abbasi 2020). SAGE was also criticized for transparency and openness as committee memberships were largely kept secret until later leaked (The Guardian 2020b). Several scientists argued that this denied it rigor and discounted trust by creating a "black box" with an interplay of scientists and civil servants that cannot be scientifically scrutinized (The Guardian 2020c, 2020d, 2020e; Sky News 2020b). Furthermore, SAGE's proceedings have largely been kept secret which stirred criticism. As the government attempted to weather the storm, it published some minutes of SAGE discussions. However, they came heavily redacted which "infuriated" several committee members claiming that redactions deliberately concealed scientific criticism of policies the government had asked them to consider (Daily Mail 2020). As experts urged for stricter measures, on the 19th of March, the government downgraded the COVID-19 threat level, thus lowering the required standards of personal protective equipment (Scally, et. al, 2020). Similar maneuvers and issues of transparency were observed concerning the release of Brexit impact assessments amidst attempts to downplay expert estimations (Dunlop, James, and Radaelli 2020). Retrospectively, countering aspects of unfavorable expert advice was clearly articulated leading up to the Brexit referendum by the current Minister for the Cabinet Office Michael Gove saying: "I think the people of this country have had enough of experts" (Portes 2017).

Driven by the need for transparent, evidence-based, and open advice, a group of leading British scientists set up an "Independent (SAGE)." In their reports, they corroborated the aforementioned issues critiquing the government's "potentially dangerous" and "counter-productive" ambivalence in suppressing transmission in favor of managing spread (entailing lighter economic impact). They cited concerns over "inaccurate, incomplete and selective data presented by government officials" and over-dependence on outsourcing to the private sector. They also called for ensuring independence, transparency, and trustworthiness of data and scientific advice (The Independent SAGE 2020).

Fueled by the wicked crisis context, we clearly observe tangible influences exerted by the government on the independence and transparency of COVID-19 scientific advice in a favorable direction of established policy legacies. Hence, we find there is a plausibility that the economic predispositions of policymakers and the ensuing sensemaking frames have influenced the identification and selection of COVID-19 scientific advice.

4.2. The case of Belgium: horizontal epistemic venue shopping

Belgium was a frontrunner in COVID-19 policy responses, even before Spain and just five days after France and Italy (University of Oxford 2020). However, Table 1 shows that the country has some of the highest cases and deaths per capita in Europe

and worldwide. A recent report by The Economist (2020) ranked Belgium as the worst in terms of "quality of policy response to the pandemic." Belgian officials explain the numbers in light of the government's decision to include suspected (confirmed by a doctor) but untested deaths (De Block 2020). While disagreements on measurement strategies can persist, there is consensus on the importance of effective lockdown and social distancing policies. As such effectiveness is largely moderated by voluntary and consistent citizen compliance, policymakers strive to maintain public compliance and avoid the degradation of caution. As illustrated earlier, behavioral epistemology plays a significant role in achieving this objective. Here, we evaluate two aspects: (1) Whether such degradation and issues of compliance have been observed? (2) Prima facie indicators of the extent to which behavioral epistemology was present in the policy formulation process.

First, we look at indicators of compliance to social distancing, stay at home orders, and lockdowns by triangulating primary indicators such as mobility data, expert interviews, and news sources. As the government decided to enforce a lockdown in March, several groups rushed to arrange last-minute "lockdown parties," an issue that a member of the government's Risk Assessment Group described as by people who "do not clearly get the message" (Het Laatste Nieuws 2020). Data from the Flemish road authority show that while road traffic dropped from February to April by around 58.8%, it started increasing from April to May by around 46%. Data obtained from one of the country's largest transport providers show a similar trend from April to May. This was observed while no substantial changes to stay at home policies, restrictions on domestic travel, or gatherings were made (University of Oxford 2020). Additionally, there was an overall rise of non-essential travel during the same period (Brzozowski 2020a). By late April, the government had issued over 60,000 lockdown violation notices with the number of violations reportedly rising (The Brussels Times 2020a; Brzozowski 2020b). Though issuing violation notices entails a discretionary aspect, a comparative view can still provide perspective. The number of lockdown violations issued in England until the 8th of June (a nation five times the population of Belgium with comparative policy stringency) stood at 15,715 (NPCC 2020). As the government proceeded to ease the lockdown, more compliance issues emerged. An example can be seen in the city of Antwerp becoming a hotspot for COVID-19 infections, necessitating a strict lockdown and rendering the city, then later the entire country "code orange" (The Brussels Times 2020b; Euronews 2020). Other incidents such as large-scale altercations with the police while attempting to enforce social distancing rules prompted debates around canceling trains and restricting access to several towns (The Brussels Times 2020c).

Second, we explore whether there was a tangible presence of behavioral epistemology at the forefront of the COVID-19 policy formulation. We do so by surveying the fourteen national advisory committees established by the government to manage the crisis (Belgian Government 2020; Office of the Prime Minister 2020). The significant number of committees and ensuing coordination issues came later to be known as Belgium's COVID-19 labyrinth (De Standaard 2020). Such issues are familiar in the Belgian context given its institutional configurational complexity (Witte 1992). This resulted in a fragmented workflow and a "lack of well-thought structure," leadership

and coordination as confirmed in our interview with a scientific advisor on one of the committees. This came in contrast to the need for superordinate management structures to coordinate multi-group responses during crises (Doyle, Paton, and Johnston 2015). While only one of those groups had a publicly available membership listing, a clear observation could be made through consolidating functional descriptions, expert interviews, and secondary sources; behavioral epistemology was largely absent at the forefront. For example, though exiting the lockdown entails significant behavioral implications; the Group of Experts on the Exit Strategy (GEES) did not include behavioral expertise (mostly medical experts and economists). Recently, the group has shut down amidst growing criticism of medical epistemology dominance to the point at which "all balance was lost" (Heynderickx 2020). Their task fell to "CELEVAL," an almost exclusively medical group of experts. This does not necessarily mean that no behavioral scientists were consulted during the crisis. However, it is an indicator of the absence of such expertise at the forefront of an issue with significant behavioral implications. Interviewing a leading scientist advising the government on one of the committees, they indicated that the scientific view consulted was "too narrow" and that "behavioural science has not been put to the forefront." This was corroborated in another interview with a leading scholar in social psychology and psychosocial health risks, echoing concerns regarding the lack of behavioral expertise and "tailored communication" leaving several cultural, ethnic, social groups, and even youth out. Another leading medical expert providing recommendations on the crisis emphasized the consequences of communication deficiency as leading to the viral spread becoming "less visible" to the public after easing the lockdown. Though respondents agreed that the civil service worked diligently during the crisis, all respondents have expressed varying degrees of concern regarding communication and behavioral sciences insights in maintaining trust and compliance.

Through triangulating sources, we believe there is plausibility to the assumption that the ambiguous hard-hitting nature of the crisis has contributed to policymakers forming a narrow view of scientific expertise needed during the crisis. This had negative implications for public compliance to COVID-19 policy responses.

5. Recommendations and conclusion

In this article, our analysis establishes the plausible influences of fast-burning wicked crises on the quality of epistemic policy learning and highlights key implications of such influences for policy design and implementation. Here, we do not aim to create league table comparisons or epidemiologically to assess COVID-19 responses. However, we employ illustrative cases elucidating policymaking dynamics to enhance future policy responses.

To facilitate the evaluative use of our analysis in other jurisdictions, we offer an exploratory analytical framework for epistemic policy learning in crisis (Figure 1), building on a similar structural approach proposed by Dunlop and Radaelli (2013) for policy learning genera. Here, we view an analytical framework as an explanatory structure providing means to organize descriptive and analytical inquiry (Goyal and Howlett 2019). This simplified framework assists policymakers to assess the

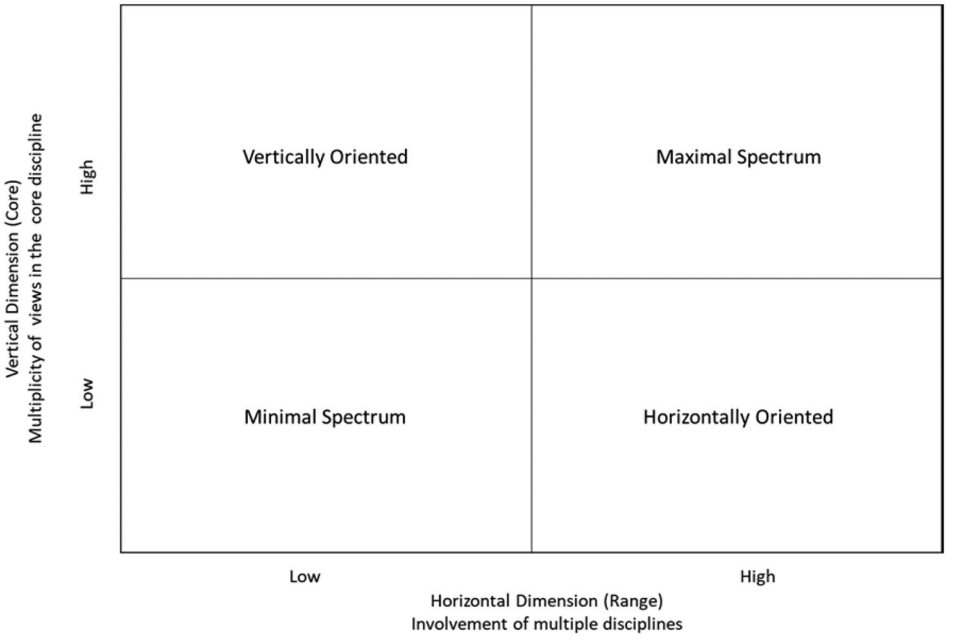

Figure 1. Epistemic dimensions of policy learning in crises.

inclusiveness of epistemic policy learning during wicked crises and accommodates for cross-case comparisons. It also facilitates assessing the relative impacts of different institutional and structural factors on learning. Our proposed dimensions yield four variants of epistemic policy learning inclusiveness: Minimal Spectrum, Maximal Spectrum, Vertically Oriented, and Horizontally Oriented. Here, no normative assumption should be made for a globally optimum variant, yet each case necessitates a deliberate assessment of a most functional approach considering several crises and context-specific parameters (e.g. scale, scope, and nature of the crisis, tradeoffs, system context, etc.).

We contrasted two cases; the case of England as an example of vertical epistemic venue-shopping with low multiplicity in the core discipline informing policy design, and the case of Belgium as an example of horizontal epistemic venue-shopping with low involvement of multiple disciplines.

5.1. Vertical epistemic venue-shopping

Vertically, at the beginning of the pandemic, England almost exclusively relied on a single-minded epistemic approach. Given our findings, we offer the following recommendations particularly within contexts with high levels of political conflict.

5.1.1. Maintaining transparency, independence, and openness

Transparency, independence, and openness remain core scope conditions of epistemic policy learning (Dunlop, James, and Radaelli 2020). Our analysis also shows them as prima facie indicators of apolitical and non-contingent use of science. As crisis conditions can provide conditions to potentially compromise transparency and openness, we

propose including the existence of independent and trusted public-facing scientific institutions as an additional scope condition. In the case of England, independent forecasts by trusted institutions expanded the necessary space for scientific argumentation and scrutiny leading to policy re-alignment (Adam 2020; Nature 2020). Here, we sidestep the debate of whether the policy reversal was epidemiologically optimal and shed light on the dynamic by which it was induced. The absence of identified scope conditions renders scientific expertise vulnerable to varying political sensemaking frames and facilitates the instrumental use of science.

5.1.2. The politics of using science

Our analysis shows that persisting Brexit era political logics (e.g. high levels of political conflict and a strong focus on economic growth) leading up to the pandemic created a substantial policy legacy constraining the set of viable policy solutions. Yet, England is not by any means an outlier. Though operationalized differently, similar responses (e.g. The United States, Brazil) can be observed in systems where policymakers have limited (or even single salient) pre-crisis policy priorities (e.g. economic growth) adopt "divergent" COVID-19 scientific advice. There, policymakers might be more inclined to craft favorable epistemic lessons if the outcomes of existing lessons are likely to impact their pre-crisis policy priorities. Such legacies (and ensuing sensemaking frames) can constrain their ability to neutrally uphold the epistemic learning process. Subsequently, such systems might prefer low vertical and horizontal varieties for better control over learning outcomes. This can be moderated by the institutionally available policymaker span of control over the learning process described by Dunlop and Radaelli (2013). This does not necessarily imply that divergent approaches to COVID-19 are scientifically lacking but necessitates an evaluation of their underlying political-scientific interactions within the context of pre-crisis agendas, intra-crisis impacts, and substantiation of grounded scientific approaches. Under those conditions, proactively ensuring transparency and openness of epistemic policy learning enhances public perception of the legitimacy of government policy and its logic. This helps policymakers avoid uninformed public scrutiny, distrust and relieves them from engaging in random strategic shifts in response to public pressure.

5.1.3. Public expectation setting

While "following the science" is a legitimate mantra, the limitations of science should be appropriately communicated (to policymakers and the public). Policymakers and the public are used to consolidated and harmonious scientific advice cumulated through prolonged internal debate; this is not necessarily feasible in a fast-burning crisis with knowledge uncertainty. As scientific knowledge is updated through the crisis, failing to dynamically delineate its limitations to the public depreciates the credibility of science and limits influence on public compliance. Intra-crisis, this can critically limit the influence of science in convincing the public to accept a COVID-19 vaccine or comply with strict measures against the next waves. Carefully crafted narratives can play a critical role in addressing this issue as established in other COVID-19 governance issues (Mintrom and O'Connor 2020).

5.2. Horizontal epistemic venue-shopping

Ambiguity and uncertainty in wicked crises complicate situational synthesis, and thus the identification of relevant expertise. Here, we make the following three main practice-oriented recommendations utilizing organizational and institutional tools that can be applied in a relatively reasonable time given the situational urgency of crises.

5.2.1. The science of choosing science: dynamic problem synthesis across networks

Investing in continuous problem synthesis and definition can help policymakers capture the dynamism and fluidity of the crisis (as scientific expertise needed also varied intra-crisis). Systems thinking and open deliberation through the boundary and discipline-spanning epistemic networks can empower learning and mitigate the effects of echo chambers in wicked settings (Boucher 2017; Wagner and Ylä-Anttila 2020. This enhances high-resolution situational synthesis, problem recognition, and thus optimal solution-oriented agenda setting during and after crises (Shpaizman 2020). This also goes beyond identifying disciplines into intra-disciplinarily identifying state-of-the-art scientifically grounded streams.

5.2.2. Managing the interdisciplinary mix

Identifying and institutionally managing an optimum context-appropriate and crisis contingent "interdisciplinary mix" beyond bureaucratic norms of institutional complexity is critical. The lack thereof could lead to siloed thinking and breakdowns in the scientific debate underlying policy formulation as observed in the case of GEES. Policy systems with complex institutional settings (such as in Belgium) can yield a labyrinth of advisory committees with challenges in coordination and integration of insights, thus rendering attempts for interdisciplinarity ineffective (even when multiple disciplines could be officially involved). This mandates the consideration of effective superordinate integration and management structures beyond simply tallying multiple disciplines.

5.2.3. The science of using science

While policymakers are naturally not trained in domain-specific sciences, time-sensitive investment in sensitizing them to the limitations and underpinnings of those sciences can be of value. This helps them cope with the uncertainty of emerging knowledge and improves their ability to use scientific advice in policy formulation and public communication. During crises, it is tempting to undertake epistemic learning as a one-shot "check-the-box" political self-preservation exercise and ignore its dialectic nature as a continuous, interlinked, and iterative process.

6. Conclusions

The crisis has shown that though tensions exist in the policymakers-scientists dynamic, science remained central to policy formulation. Moderately present, such tensions are fathomable signs of a natural discourse gap between different sensemaking frames (Rubin and de Vries 2020). This emphasizes the need for a deliberately tailored, crisis-specific "policy-science-public" discourse balancing the policymakers' openness to

science, its independence, and maintaining public trust in the trifecta. Here, the vertical and horizontal dimensions of epistemic policy learning are entwined where science not only contributes to the provision of policy knowledge but also to the design and management of both the internal policymaker-scientist and public-facing narratives.

Given our findings, we recommend investing intellectual resources in furthering the research agenda on epistemic policy learning in crises, particularly to elaborate on scope conditions and determinants for different variants identified. Additionally, studying the structural influences of wicked crises on this learning modality can help policymakers maintain context-appropriate integration of scientific advice into the policy formulation and implementation processes.

Notes

1. Cases and deaths data obtained from WHO Sit-rep 195 as of 2nd of August 2020
2. Excess mortality data obtained from Euromomo, as of 2nd of August 2020
3. Data obtained from WHO Sit-rep 54 as of 14th of March 2020

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